1. PUBLIC HEALTH STATEMENT

This public health statement tells you about mustard gas and the effects of exposure.

The Environmental Protection Agency (EPA) identifies the most serious hazardous waste sites in the nation. These sites make up the National Priorities List (NPL) and are the sites targeted for long-term federal cleanup activities. Mustard gas has been found in at least 3 of the 1,585 current or former NPL sites. However, the total number of NPL sites evaluated for mustard gas is not known. As more sites are evaluated, the sites at which mustard gas is found may increase. This information is important because exposure to mustard gas may harm you and because these sites may be sources of exposure.

When a substance is released from a large area, such as an industrial plant, or from a container, such as a drum or bottle, it enters the environment. This release does not always lead to exposure. You are exposed to a substance only when you come in contact with it. You may be exposed by breathing, eating, or drinking the substance, or by skin contact.

If you are exposed to mustard gas, many factors determine whether you'll be harmed. These factors include the dose (how much), the duration (how long), and how you come in contact with it. You must also consider the other chemicals you're exposed to and your age, sex, diet, family traits, lifestyle, and state of health.

1.1 WHAT IS MUSTARD GAS?

The term mustard gas refers to several chemicals. In its most common sense, it means sulfur mustard, which is the chemical that is stored at Army facilities. Mustard gas does not behave as a gas under ordinary conditions. The commonly used term mustard gas can be confusing, since the compound is stored as a liquid and is not likely to change into a gas immediately if it is released at ordinary temperatures. As a liquid, it is colorless when pure and it is brown when mixed with other chemicals. It is odorless when pure, but can have a slight garlic smell when

mixed with other chemicals. It dissolves easily in fats, oils, alcohol, and gasoline. Mustard gas dissolves slowly in unstirred water, but within minutes in stirred water. When it does dissolve, it turns into different chemicals. It was made to be used in chemical warfare and was used as early as World War I and as late as the Iran-Iraq War in 1980–1988. It is not used in the United States, except for laboratory testing of health effects and antidotes. More information on the physical and chemical properties of mustard gas can be found in Chapters 4 and 5.

1.2 WHAT HAPPENS TO MUSTARD GAS WHEN IT ENTERS THE ENVIRONMENT?

Mustard gas is not found naturally in the environment in any amount. If mustard gas is accidentally spilled at an Army base where it is stored, it could be released into the environment. Currently, all of the mustard gas at these Army bases is being destroyed by burning. The law requires that the Department of Defense destroy all mustard gas by 2004. Once all of the mustard gas is destroyed, it will no longer be dangerous. If mustard gas is put on soil, it will remain there for at least a day, but may remain up to several days until it disappears. The time it takes for mustard gas to disappear from soil depends on how hot it is outside and how strongly the wind is blowing. If it is hot and the wind is strong, then mustard gas will disappear faster. When mustard gas disappears from soil, it becomes a gas or changes into other compounds if the soil is wet. However, if mustard gas is buried underground, it may not disappear for several years. Mustard gas will not move through soil to underground water. If mustard gas is put in water, it dissolves within minutes if the water is stirred, and slowly if is not. When it does dissolve, it changes to other compounds. The time necessary for a quantity of mustard gas that is dissolved in water to decrease by half is about 2 minutes at 40 EC (104EF). If large amounts of mustard gas are spilled into water, most of the mustard gas will change to other compounds very slowly or not at all. If mustard gas is released into air, it will react with components in the air to form other compounds. The time necessary for a quantity of mustard gas in air to decrease by half is about 2 days at 25 EC (77EF). Because mustard gas changes to other chemicals in the environment, it will not concentrate in plants or animals. For more information on what happens when mustard gas enters the environment, see Chapter 6.

1.3 HOW MIGHT I BE EXPOSED TO MUSTARD GAS?

Mustard gas is not currently being produced in the United States. The only possibility of exposure of the general public is through accidental release from the Army bases where it is stored. Storage areas are heavily guarded, and storage buildings are sealed. People who work at these Army bases are more likely to be exposed. Mixed in water, mustard gas changes its form within minutes, so it is very unlikely that you would ever drink it. Any possibility of exposure of the general population by way of water (drinking, cooking, bathing, swimming) is therefore very small. Mustard gas does not occur naturally, and, therefore, there are no background levels in the soil, air, water, or food. If it is accidentally released, it will stay in the air or on the ground for 1–3 days. For more information on possible exposures, see Chapter 6.

1.4 HOW CAN MUSTARD GAS ENTER AND LEAVE MY BODY?

Mustard gas can enter your body easily and quickly if you breathe the gas vapors or if you get it on your skin. It can easily pass through your clothing to get onto your skin. It is possible that you could breathe mustard gas or get it on your skin at hazardous waste sites that contain this material. Mustard gas changes into other chemicals in your body, and these chemicals mostly leave your body in the urine within a few weeks. For more information, see Chapter 3.

1.5 HOW CAN MUSTARD GAS AFFECT MY HEALTH?

One way to see if a chemical will hurt people is to learn how the chemical is absorbed, used, and released by the body; for some chemicals, animal testing may be necessary. Animal testing may also be used to identify health effects such as cancer or birth defects. Without laboratory animals, scientists would lose a basic method to get information needed to make wise decisions to protect public health. Scientists have the responsibility to treat research animals with care and compassion. Laws today protect the welfare of research animals, and scientists must comply with strict animal care guidelines.

Mustard gas burns your skin and causes blisters within a few days. The parts of your body that are sweaty are the most likely to be harmed. Mustard gas makes your eyes burn, your eyelids swell, and causes you to blink a lot. If you breathe it, mustard gas can cause coughing, bronchitis, and long-term respiratory disease. Mustard gas may affect reproduction. Some men exposed to mustard gas during war have reported decreased sexual drive and have had lower sperm counts. The Department of Health and Human Services has determined that mustard gas is a known carcinogen. The International Agency for Research on Cancer has also determined that mustard gas is carcinogenic to humans. It can cause cancer in your airways and lungs later in life. If you are exposed to a very large amount of mustard gas, you can eventually die from it. Some of the chemicals that are formed when mustard gas is burned or spilled into water can also be irritating to the skin.

1.6 HOW CAN MUSTARD GAS AFFECT CHILDREN?

This section discusses potential health effects from exposures during the period from conception to maturity at 18 years of age in humans.

Mustard gas causes the eyes and skin of children to burn similarly to adults; however, the burns are more severe in children. Blisters appear sooner, as early as 4 hours after mustard gas contact with skin. Coughing and vomiting are early symptoms of exposure to mustard gas in children. Mustard gas vapors are heavier than air and since young children are closer to the ground or floor because of their height, they may be exposed to more mustard gas vapors than adults during accidental exposures. Mustard gas may cause birth defects or affect the development of children. An increased incidence of birth defects has been reported among newborn babies of mustard gas victims exposed during war. Studies in animals also indicate that mustard gas may affect development. It is not known if mustard gas can cross the placenta or be passed to infants in breast milk.

1.7 HOW CAN FAMILIES REDUCE THE RISK OF EXPOSURE TO MUSTARD GAS?

If your doctor finds that you have been exposed to significant amounts of mustard gas, ask whether your children might also be exposed. Your doctor might need to ask your state health department to investigate.

The risk of exposure to mustard gas may be significant only for those who live or work near Army bases and facilities that store it. Mustard gas is currently being destroyed at these facilities and thus, the risk of exposure due to accidents is decreasing.

1.8 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO MUSTARD GAS?

There are effective medical tests to determine if you have been exposed to mustard gas. Mustard gas or some of the chemicals that it makes in your body can be found by testing your blood or urine. For more information, see Chapters 3 and 7.

1.9 WHAT RECOMMENDATIONS HAS THE FEDERAL GOVERNMENT MADE TO PROTECT HUMAN HEALTH?

The federal government develops regulations and recommendations to protect public health. Regulations can be enforced by law. Federal agencies that develop regulations for toxic substances include the Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), and the Food and Drug Administration (FDA). Recommendations provide valuable guidelines to protect public health but cannot be enforced by law. Federal organizations that develop recommendations for toxic substances include the Agency for Toxic Substances and Disease Registry (ATSDR) and the National Institute for Occupational Safety and Health (NIOSH).

Regulations and recommendations can be expressed in not-to-exceed levels in air, water, soil, or food that are usually based on levels that affect animal, and these levels are then adjusted to help protect people. Sometimes these not-to-exceed levels differ among federal organizations because of different exposure times (an 8-hour workday or a 24-hour day), the use of different animal studies, or other factors.

Recommendations and regulations are periodically updated as more information becomes available. For the most current information, check with the federal agency or organization that provides it. Some regulations and recommendations for mustard gas include the following:

The federal government considers mustard gas an extremely hazardous substance. The federal government has recommended a maximum concentration in air to which the general public should be exposed. This concentration is 0.0001 milligrams per cubic meter of air, averaged over 3 days. Stored quantities of 500 pounds or more must be reported to the State Emergency Response Commission, the fire department, and the Local Emergency Planning Committee. Spills of over 1 pound must be reported to the National Response Center. For more information, see Chapter 8.

1.10 WHERE CAN I GET MORE INFORMATION?

If you have any more questions or concerns, please contact your community or state health or environmental quality department or

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road NE, Mailstop E-29
Atlanta, GA 30333

* Information line and technical assistance

Phone: 1-888-42-ATSDR (1-888-422-8737)
Fax: 1-404-498-0057

ATSDR can also tell you the location of occupational and environmental health clinics. These clinics specialize in recognizing, evaluating, and treating illnesses resulting from exposure to hazardous substances.

* To order toxicological profiles, contact

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Phone: 1-800-553-6847 or 1-703-605-6000